A. Cover Sheet *(Attach to front of proposal.)*

1. Specify: ☒ agricultural project or ☐ urban project — ☐ individual application or ☒ joint application

2. Proposal title—concise but descriptive: TOTAL IRRIGATION MANAGEMENT AND DORMANT SPRAY REDUCTION PROGRAM

3. Principal applicant—organization or affiliation: WEST STANISLAUS RCD, EAST STANISLAUS RCD

4. Contact—name, title: NORMAN CROW, CHAIRMAN

5. Mailing address: 220 NORTH EL CIRCULO, PATTERSON, CA 95363

6. Telephone: 209-892-3026

7. Fax: 209-892-3026

8. E-mail: CROWS5@inreach.com H2O_Saver@PowerHydrodynamics.com

9. Funds requested—dollar amount: $ 516,569.00

10. Applicant cost share funds pledged—dollar amount: $ 510,225.00

11. Duration—(month/year to month/year): JUNE 2001 to DEC 2003

12. State Assembly and Senate districts and Congressional district(s) where the project is to be conducted: STATE ASSEMBLY DISTRICTS 25 + 26 STATE SENATE DISTRICT 12 US CONGRESSIONAL DISTRICT 18

13. Location and geographic boundaries of the project: STANISLAUS COUNTY

14. Name and signature of official representing applicant. By signing below, the applicant declares the following:
    - the truthfulness of all representations in the proposal;
    - the individual signing the form is authorized to submit the application on behalf of the applicant;
    - the applicant will comply with contract terms and conditions identified in Section 11 of this PSP.

NORMAN CROW — 2-12-01
(printed name of applicant) — *(date)*

Norman W. Crow
(signature of applicant)

CALFED Grant

Task # 1

Quantifiable Objectives: 106, 107, 113, 114 and 127

Title: Total Irrigation Management

Executive Summary:

The West Stanislaus Resource Conservation District (WSRCD) is located approximately 70 miles southeast of San Francisco and includes over 200 square miles of irrigated cropland. There are eight creeks that cross the WSRCD draining from the eastern slopes of the Coast Range to the San Joaquin River. During the summer months, the flow in these creeks consists entirely of irrigation runoff. This runoff is conveyed through eighteen main agricultural drains, in addition to creeks, and discharged into the San Joaquin River.

The East Stanislaus Resource Conservation District (RCD) was formed through consolidation of the Salida Resource Conservation District, S.T.& J. Resource Conservation District, portions of Ballico Resource Conservation District in Stanislaus County, and portions of La Paloma Resource Conservation District in Stanislaus County. Each of the participating districts was established under the same enabling legislation, Public Resources Code, Section 9000, et.seq., or predecessor legislation. The sphere of influence of the reorganized East Stanislaus Resource Conservation District encompassed the relative sphere of influences of the previous participating districts, which in general encompasses those lands in Stanislaus County east of the San Joaquin River.

Stanislaus County contributes tremendously to California's agricultural output. This area ranks in the top two most productive counties for crops such as dry beans, almonds, apricots, as well as casaba, crenshaw, and honeydew melons. Six of the top ten commodities from Stanislaus County are almost exclusively grown in California, a fact that emphasizes the importance of this county's agricultural production to the rest of the nation. Gross agricultural income for Stanislaus County in 2000 will again exceed one billion dollars. Other crops include peas, tomatoes, broccoli, cauliflower, strawberries, sweet potatoes, spinach, sugar beets, corn, walnuts, cherries, apples, alfalfa and peaches.

The ESRCD and the WSRCD have a long history of being leaders in water conservation and sediment reduction in California. We would like to continue this tradition by offering a program in "Total Irrigation Management" (TIM) that will look at the system, soil, weather (historical and current through CIMIS) and current management. There are many services available to growers in Stanislaus County, pertaining to irrigation scheduling using a moisture probe of some sort, but none of those services take into account the system's limitations nor do they do anything to work with the grower on management issues (such as "what can be done to improve the Distribution Uniformity (DU) of my irrigation system" or "why is the moisture level always low/high in this area of my field"). We feel that great strides in water conservation will occur if you empower the growers with the knowledge they need and to help them to use that knowledge in a way that is economically and environmentally viable for their operation.

We will start by selecting growers with a number of different crops and a number of different irrigation system types from different areas of the county. This will give us a diverse mix and will help to develop “Best Management Practices” (BMPs) that we can then share with other growers and agencies throughout the State. Next we will install the irrigation scheduling sites in the selected fields. This will be done with the help of NRCS soil survey maps, hand held moisture probes and the grower. These sites will be evaluated throughout the season so we are sure that we have the sites in areas that will represent the entire field. The plan is to have 4 sites in each field to insure that the data collected is accurate. Next we will do a complete irrigation system evaluation with our Mobile Irrigation Lab to determine DU of the system. We will also recommend changes that will improve DU, increase infiltration and reduce run-off. If changes are made to the system based on the recommendations from the first evaluation, a second evaluation will be made to determine the new DU. This is an important part of the process because most growers do not add DU to the irrigation schedule. Next we will calculate an irrigation schedule for the grower (in gross hours per week) using the “PRISM” system manufactured by ISM, Inc. We are using this system because of the combination of ease to use and accuracy. Several other RCDs Mobile Irrigation Labs use this system. All during the season we will be making recommendation to decrease set times or increase DU. Each time a major change is made to the system or in the management of the system we will retest system. The grower will have the final say in what goes on in their field but we will be gathering a good deal of data about potential water/energy savings for that field. When feasible we will track the yield for the season and compare it to historical yields for the field.

The goal of the program is to identify a savings potential of 15% over the entire county. If there were a potential savings of 15% it would equate to approximately 5,000 acre-feet or $125,000.00 per year. We will accomplish this goal by keeping track of the total water applied to each of the fields in the study and comparing the total water applied, to previous years using the records that the grower and the irrigation districts provide. We will be able to maintain a database on each of the fields that will give us real time information.

There are several scheduling services in the county now that use Neutron probes and give the growers a moisture level of the soil in their field. The cost of this service is between $600 and $650 per site. We are putting together a program that goes way beyond what is currently being done that will cost only $750 per site. It is the hope of both RCDs that the Irrigation Districts involved or the grower community as a whole will see the value in a program like “TIM” and that funding to continue will be made available through a cost share program for the growers.

The second part of this program will be training workshops both in English and in Spanish that will outline the principles behind efficient irrigation. We hope to hold at least three workshops per year.

The goal of this workshop will be to help local growers train irrigators before the irrigation season and to learn themselves the BMPs for efficient irrigation. We hope to gain the support of the local Irrigation Districts to fund future workshops and possibly make this training a requirement for the growers to receive their irrigation water each year.

Many growers don't have the time to properly train their irrigators when they arrive from Mexico each year so the growers give them some basic instructions and send them out. In furrow irrigation the result is often water that runs off the field for hours or water that is applied so slowly that it takes forever to get out. Both of these problems are very common and make for very inefficient irrigations. We feel that the right training will help the growers and their irrigators. By empowering the irrigators to make educated decisions regarding the management of the irrigation water, the grower should see an increase in yields and a decrease in the amount of water used to grow the crop.

We will hold three field days to report on our findings and submit the results to the press to be published. We will also produce a flyer to be used by the grower on how to use the BMPs that we develop.

We have many cooperators for this study such as Horizon Ag-Products, Modesto Junior College, and all of the farmers that participate in the study. These cooperators will be providing supplies or in-kind support.

The following Irrigation Districts will be working on this project. The Modesto Irrigation District, the Turlock Irrigation District, the Oakdale Irrigation District, the West Stanislaus Irrigation District, the Patterson Irrigation District, the Del Puerto Water District and the Central California Irrigation District.

We also have a number of supporters from the following agencies. They are the USDA's Natural Resources Conservation Service, the University of California Cooperative Extension of Stanislaus County, the San Luis & Delta–Mendota Water Authority, The Friends of the Tuolumne and the Tuolumne River Preservation Trust.

Other supporters of our CalFed proposal are, Stanislaus County Supervisor Paul Caruso, 18th District US Representative Gary Condit, 12th District State Senator Dick Monteith, 25th District State Assemblyman David Cogdill and 26th District State Assemblyman Dennis Cardoza.

The proposed project and accomplishments outlined for Task # 1 are based on the budget provided. Output will be proportioned to grant received.

Task # 2

Priority Outcomes: 81, 101, 120, 121

Title: Dormant Spray Run-off Reduction Program

Executive Summary:

Currently one hundred miles of the San Joaquin River are included in the list of impaired water bodies in the 1990 California State Water Resources Control Board Quality Assessment. Previous studies pinpointed the West Stanislaus area as one of the highest contributors of soluble pesticide residue and sediment-borne contaminants affecting beneficial uses of the San Joaquin River.

West Stanislaus has been recognized as a consistent Non-point Source Pollution area due to the combined effects of: (1) The area's physical geography and location immediately adjacent to the river; (2) the extensively altered system of surface and subsurface hydrology; (3) soils that are derived from coastal range parent material which yields erosive soils; and (4) more diversified land use patterns adjacent to the river relative to other areas in the basin.

The area is also important because of the inflow of the San Joaquin River to the Sacramento-San Joaquin Delta, which transfers large amounts of water for urban uses to the southern part of the state. Soluble pesticide residue and other contaminants from Stanislaus County reach the Sacramento-San Joaquin Delta through the three rivers that run through the county.

The WSRCD's Mobile Irrigation Lab conducted studies during the 1997, 1998 and 1999 growing seasons to evaluate the effects different soil and water amendments would have on the irrigation water infiltration rates for the first irrigation after the field was tilled. The study also set out to document the increased water infiltration and reduction of TSS (Total Suspended Solids) and pesticide residues that may be attached to the soil particles in the tail water when different forms of PAM (polyacrylamides) were used and applied in different ways.

The goal of all three studies was to provide the local growers with an incentive (through a reduction in the amount of irrigation water used) to use PAM, Humic Acid, and gypsum while irrigating. The use of these water amendments resulted in less tail water leaving the farm and tail water that meets or exceeds the locally established WSRCD goal of 300 mg/l TSS.

All of the studies were a great success with 80 side-by-side tests (control verses treatment) conducted with the cooperation of thirteen different growers. This study provided the WSRCD, the Natural Resources Conservation Service, and the University of California Cooperative Extension with some very valuable data, which was passed on to the local growers through the WSRCD's monthly newsletter, "West Side Water". Initial results

indicate a potential increase in infiltration of between 16 and 50 percent and a reduction in sediment of 5300 TSS to as low as 18 TSS when PAM was used. The amount of water that could have been saved on the fields tested was around 38%.

We now need to address another source of contaminants that are reaching our rivers. That source is dormant spray run-off.

The ESRCD and the WSRCD are proposing that our Mobile Irrigation Lab monitor six fields (three treated and three control) and collect run-off samples for each irrigation event following the application of pesticides during the 2001 irrigation season and all rainfall events during the winter of 2001/2002. We will treat the fields with liquid Humic Acid sprayed on the ground at a rate of 3 gallons per acre before the irrigation events and in the fall before the rainy season. Water samples will be taken to a qualified lab to screen for the pesticide that was applied. We will be treating the orchards with Humic Acid liquid fertilizer. We are doing both irrigation run-off and winter rain run-off so we are guaranteed to gather a sufficient amount of data. We are also going to use an electrostatic spray rig for one set of tests (one control and one treated). This will be done to see if the volumes of spray used (25 to 30 gallons per acre vs. 100 to 200 gallons per acre) will have a positive impact on the reduction of the amount of detectible pesticides that may be leaving the field.

Studies done in at Michigan State University and at the University of Illinois have shown that Humic Acid binds with the pesticides and neutralizes them. This same observation has been made in the book, *Pesticides in Soil and Water,* and covered by the American Society of Agronomy in it's magazine. During these tests the ability of Humic Acid to bind with and hold pesticides and herbicides was seen as an obstacle that needed to be over come if you were applying these materials too close to an application of Humic Acid. We on the other hand see this as a potential tool that farmers could use to reduce the amount of pesticides that leave their fields during irrigation and rain events.

The two studies done by the WSRCD have shown that Humic Acid increase infiltration by an average of 23%. Our hope is that the dormant spray materials that are washed out of the trees during the rain events will be bound up and held in the soil until time has a chance to render them harmless. This is why we feel that this study has some merit. The results we gain during this program will be shared with the growers and the BMPs will be refined for improved control of winter run-off. Most of the growers understand that they may have to change their farming methods in the near future and reduction of dormant spray run-off is very important.

The goal of this program will be to demonstrate a possible solution to reduce offsite movement of pesticide-laden sediment through the use of soil and water amendments and Best Management Practices (BMPs) while irrigating and during the dormant season. The use of these amendments and BMPs can result in less tail water and dormant spray run-off leaving the farm. This reduction will mean less non-point source pollution entering the San Joaquin River, Stanislaus River, the Tuolumne River, the Sacramento-San Joaquin Delta and San Francisco Bay Estuary.

We will hold three field days to report on our findings and submit the results to the press to be published. We will also produce a flyer to be used by the grower on how to use the BMPs that we develop.

We have many cooperators for this program such as Horizon Ag-Products, Modesto Junior College, and all of the farmers that participate in the study. These cooperators will be providing monetary or in-kind support.

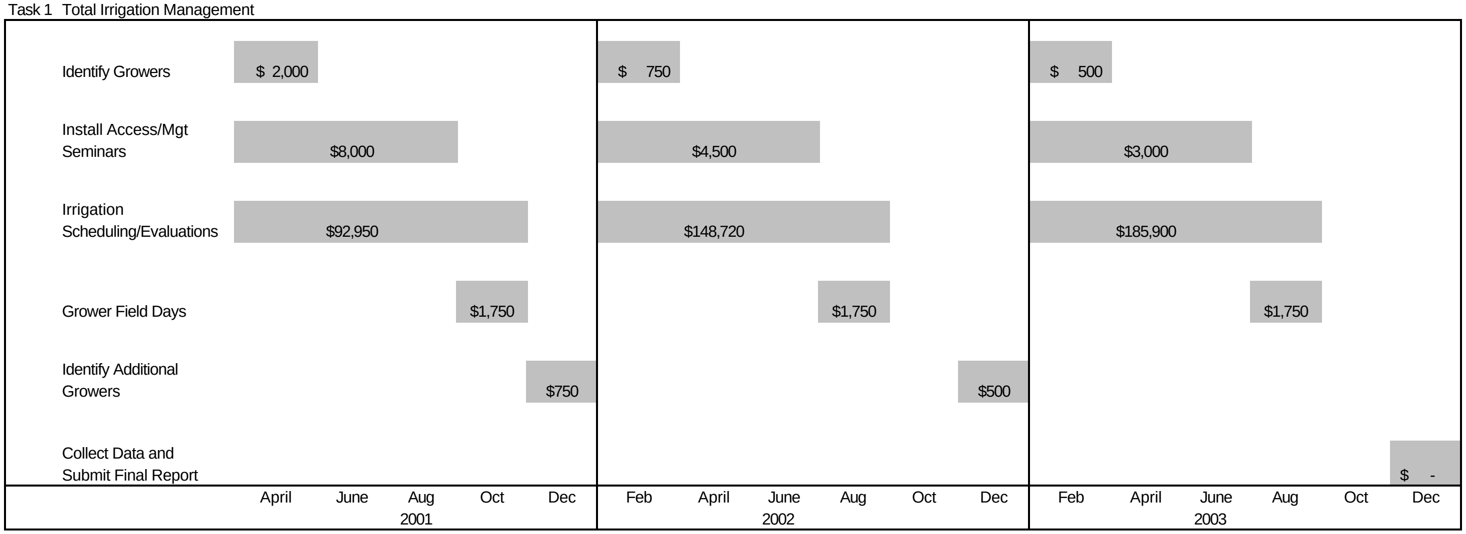
The following Irrigation Districts will be working on this project. The Modesto Irrigation District, the Turlock Irrigation District, the Oakdale Irrigation District, the West Stanislaus Irrigation District, the Patterson Irrigation District, the Del Puerto Water District and the Central California Irrigation District.

We also have a number of supporters from the following agencies. They are the USDA's Natural Resources Conservation Service, the University of California Cooperative Extension of Stanislaus County, The Friends of the Tuolumne, The Tuolumne River Preservation Trust and the San Luis & Delta–Mendota Water Authority.

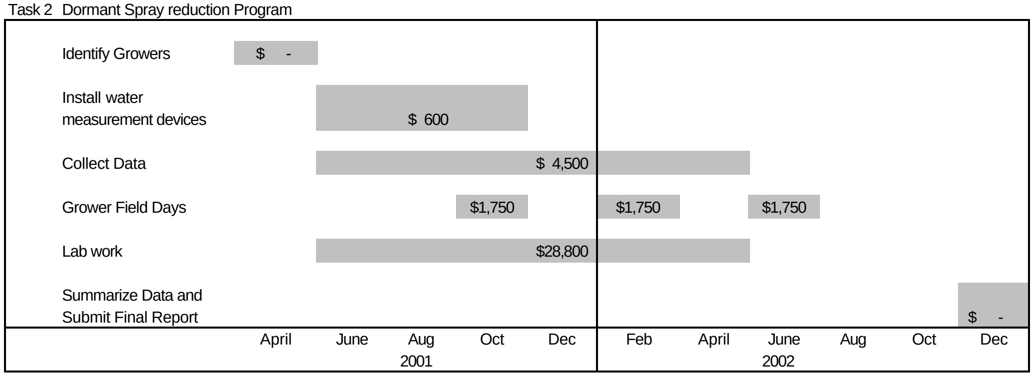
Other supporters of our CalFed proposal are, Stanislaus County Supervisor Paul Caruso, 18^{th} District US Representative Gary Condit, 12^{th} District State Senator Dick Monteith, 25^{th} District State Assemblyman David Cogdill and 26^{th} District State Assemblyman Dennis Cardoza.

Stanislaus County is the only place in California where this BMP is being demonstrated to the growers. We hope to share our findings with any and all that are interested. If we are not able to secure these funds, the study will be delayed until funds are found. The proposed project and accomplishments outlined for Task # 2 are based on the budget provided. Output will be proportioned to grant received.

Task 1 Total Irrigation Management



Task 2 Dormant Spray reduction Program



Budget For TIM Project

Net Cost For Project	**RCD Admin Cost 5%**	**Cost For Project**	**In-Kind Cost Share For Project**	**Avg. Cost Per Year**
$ 452,820.00	**$ 22,641.00**	**$ 475,461.00**	**$ 476,175.00**	**$ 158,487.00**

Avg. Net Cost per tube	**Avg. Cost per tube**	**Total Budget For Project**	**Avg. Total Budget Per Yea**
$ 754.70	**$ 792.44**	**$ 951,636.00**	**$ 317,212.00**

Year 1

Field Work

Install Tubes

Cost per hour	Hours for task	tubes per field	# of fields	Times per year	Total
$ 100.00	1	4	25	1	$ 10,000.00

Collect Data

Cost per hour	Hours for task	tubes per field	# of fields	Times per year	Total
$ 100.00	0.17	4	25	26	$ 44,200.00

Calc Schedule

Cost per hour	Hours for task	tubes per field	# of fields	Times per year	Total
$ 100.00	0.25	N/A	25	26	$ 16,250.00

Irrigation Evaluations

Cost per Test	Hours for task	tubes per field	# of fields	Times per year	Total
$ 650.00	N/A	N/A	25	2	$ 32,500.00
				Subtotal	**$ 102,950.00**

Field Day	Hours for task	tubes per field	# of fields	Times per year	
$ 1,750.00	N/A	N/A	N/A	1	$ 1,750.00
				Total	**$ 104,700.00**

Year 1

In-Kind Portion of Budget

Extra time needed by Farmer to review data and implement changes

Cost per hour	Hours for task	tubes per field	# of fields
$ 90.00	1.75	N/A	25

MJC Portion of Field Days

Field Day	Hours for task	tubes per field	# of fields
$ 1,750.00	N/A	N/A	N/A

Year 2

Field Work

Install Tubes

Cost per hour	Hours for task	tubes per field	# of fields	Times per year	Total
$ 100.00	1	4	15	1	$ 6,000.00

Year 2

In-Kind Portion of Budget

Extra time needed by Farmer to review data and implement changes

Cost per hour	Hours for task	tubes per field	# of fields
$ 90.00	1.75	N/A	40

Collect Data

Cost per hour	Hours for task	tubes per field	# of fields	Times per year	Total
$ 100.00	0.17	4	40	26	$ 70,720.00

Calc Schedule

Cost per hour	Hours for task	tubes per field	# of fields	Times per year	Total
$ 100.00	0.25	N/A	40	26	$ 26,000.00

Irrigation Evaluations

Cost per Test	Hours for task	tubes per field	# of fields	Times per year	Total
$ 650.00	N/A	N/A	40	2	$ 52,000.00
				Subtotal	**$ 154,720.00**

Field Day	Hours for task	tubes per field	# of fields	Times per year	
$ 1,750.00	N/A	N/A	N/A	1	$ 1,750.00
				Total	**$ 156,470.00**

MJC Portion of Field Days

Field Day	Hours for task	tubes per field	# of fields
$ 1,750.00	N/A	N/A	N/A

Year 3

Field Work

Install Tubes

Cost per hour	Hours for task	tubes per field	# of fields	Times per year	Total
$ 100.00	1	4	10	1	$ 4,000.00

Collect Data

Cost per hour	Hours for task	tubes per field	# of fields	Times per year	Total
$ 100.00	0.17	4	50	26	$ 88,400.00

Calc Schedule

Cost per hour	Hours for task	tubes per field	# of fields	Times per year	Total
$ 100.00	0.25	N/A	50	26	$ 32,500.00

Irrigation Evaluations

Cost per Test	Hours for task	tubes per field	# of fields	Times per year	Total
$ 650.00	N/A	N/A	50	2	$ 65,000.00
				Subtotal	**$ 189,900.00**

Field Day	Hours for task	tubes per field	# of fields	Times per year	
$ 1,750.00	N/A	N/A	N/A	1	$ 1,750.00

Year 3

In-Kind Portion of Budget

Extra time needed by Farmer to review data and implement changes

Cost per hour	Hours for task	tubes per field	# of fields
$ 90.00	1.75	N/A	50

MJC Portion of Field Days

Field Day	Hours for task	tubes per field	# of fields
$ 1,750.00	N/A	N/A	N/A

Total	**$ 191,650.00**

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Times per year	Total
26	$ 102,375.00

Times per year	
1	$ 1,750.00

Total	**$ 104,125.00**

Times per year	Total
26	$ 163,800.00

Times per year	
1	$ 1,750.00
Total	**$ 165,550.00**

Times per year	Total
26	$ 204,750.00

Times per year	
1	$ 1,750.00
Total	**$ 206,500.00**

Budget for Dormant Spray Reduction Program

Net Cost For Project	RCD Admin Cost 5%	Cost For Project	In-Kind Cost Share For Project
$ 39,150.00	**$ 1,957.50**	**$ 41,107.50**	**$34,050.00**

Total Budget For Project
$75,157.50

Year 1

Field Work

Install water measurement Device

Cost per hour	Hours for task	Location per field	# of fields	Times per year	Total
$ 100.00	1	1	6	1	$ 600.00

Collect Data

Cost per hour	Hours for task	Location per field	# of fields	Times per year	Total
$ 100.00	0.5	1	6	15	$ 4,500.00

Lab Work

Cost per test	# of samples	Location per field	# of fields	Times per year	Total
$ 160.00	2	1	6	15	$28,800.00
				Subtotal	**$33,900.00**

Field Days

Cost per field day	Times per year	Total
$ 1,750.00	3	$ 5,250.00
	Total	**$39,150.00**

Year 1

In-Kind Portion of Budget

Liquid Humic Acid to apply to treated fields

Cost per gallon	Gallons per field	# of fields	Times per year	Total
$ 5.00	300	3	4	$18,000.00

Increased time for Farmer to apply Liqud Humic Acid

Cost per Hour	# of Hours	# of fields	Times per year	Total
$ 90.00	10	3	4	$10,800.00

MJC Portion of Field Days

Field Days

Cost per field day	Times per year	Total
$ 1,750.00	3	$ 5,250.00
	Total	**$34,050.00**

Quantifiable Objectives 113, 114, 127, 130, 144

Using the CVGSM data set and Details of Quantifiable Objectives the following is the diversion reduction estimate for QO 113,114, 130;

Percolation to Groundwater and Surface Water Return Sub-Regions 11 & 12				
a	Weighted Average Year	962.6	Thousand Acre Feet	
Acreage Subregions 11 & 12				
b	Total	407.8	Thousand Acres	
c	Affected by Project	10	Thousand Acres	
Estimated Reduction in Diversions				
d		15	percent	
e		3.54	Thousand Acre Feet (a*c/b*d)	
Potential reduction in nonproductive ET for QO 127, 144				
f	Total Potential	15.7	Thousand Acre Feet	
g	Potential Acreage	59.5	Thousand Acres	
h	Estimated Acreage	2	Thousand Acres	
i	Estimate	0.53	Thousand Acre Feet (e/f*g)	
j	**Total Reduction**	**4.07**	**Thousand Acre Feet (e+i)**	note: the uniformity savings for drip irrigation is assumed in e

Depending upon the location of the selected fields the diversion reduction will be monitored and verified for the following Quantifiable Objectives;

Stanislaus River (QO 113); Quantified Targeted Benefit Chang	113.5	Thousand Acre Feet
Tuolumne River (QO 114); Quantified Targeted Benefit Chang	21.1	Thousand Acre Feet
Merced River (QO 130); Quantified Targeted Benefit Change	1.5	Thousand Acre Feet

Diversion reductions will be monitored using delivery records from Oakdale, South San Joaquin, Modesto and Turlock Irrigation Districts.

Quantifiable Objectives 106, 107

Using the CVGSM data set and Details of Quantifiable Objectives the following estimate for irrecoverable flow reduction is;

Percolation to Groundwater and Surface Water Return Sub-Region				
a	Weighted Average Year	152.3	Thousand Acre Feet	
Acreage Subregions 11 & 12				
b	Total	429.5	Thousand Acres	
c	Affected by Project	10	Thousand Acres	
Estimated Reduction in Irrecoverable Flows				
d		15	percent	
e		0.53	Thousand Acre Feet (a*c/b*d)	
Potential reduction in nonproductive ET for QO 127, 144				
f	Total Potential	8.7	Thousand Acre Feet	
g	Potential Acreage	47.2	Thousand Acres	
h	Estimated Acreage	2	Thousand Acres	
i	Estimate	0.37	Thousand Acre Feet (e/f*g)	
j	**Total Reduction**	**0.90**	**Thousand Acre Feet (e+i)**	note: the uniformity savings for drip irrigation is assumed in e

Bill Power, Owner
Power Hydrodynamics
6301 Bearden Lane
Modesto. CA 95357
209 527-2908
E-mail: bill@powerhydrodynamics.com

Mobile Lab operator for 10 years. Completed over 600 Irrigation System Evaluations. Currently have contracts with West Stanislaus RCD, East Stanislaus RCD, Stockton East Water District, The San Luis & Delta/Mendota Water Authority, The Santa Clara Valley Water District, The San Benito County Water District, and The Center for Irrigation Technology at Cal State Fresno to run Mobile Lab program.

Pump tester for 10 years. Had PG&E contract for 7 years. Tested over 3500 pumps of all sizes and types.

Completed all course work at the Cal Poly SLO, ITRC for School for Irrigation Managers in both Ag and Landscape.

Completed three years of studies on sediment and tail-water reduction for both the DOC and BOR on grants through the West Stanislaus RCD.

Articles about the sediment reduction / infiltration work I have done in the following: The California Farmer Feb. 1996, The Furrow (John Deere Magazine) Spring 1997 and Feb. 2000, Vegetable Magazine Winter 2000